

Workshop Presentation and Hot Topics

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Abstract

The workshop ‘Astrophysical Dynamics 1999/2000’ followed a homonymous advanced research course, and both activities were organized by me. In this opening paper of the proceedings book, I describe them and document their *strong* impact on the academic life of the local institutions.

1 Introduction

The advanced research course was held at Chalmers University of Technology and Göteborg University in October–December 1999; it was open to graduate students, senior researchers, and motivated under-graduate students with good background in physics and mathematics. The course covered several multi-disciplinary issues of modern research on astrophysical dynamics, and thus also of interest to physicists, mathematicians and engineers. The major topic was gas dynamics, viewed in context with stellar dynamics and plasma physics. The course was complemented by parallel seminars on hot topics given by experts in such fields, and open to a wide scientific audience. In particular, I gave a friendly introduction to *wavelets*, which are becoming an increasingly powerful tool not only for processing signals and images but also for analysing fractals and turbulence, and which promise to have important applications to dynamical modelling of disc galaxies. The course is presented in more detail in Sect. 2. The basic reference is Romeo (1999b); see also the references cited therein and in Sect. 2, and Romeo (1999a) for a discussion of my ideas about teaching (in a different context).

The workshop was held at Onsala Space Observatory on 12 and 13 January, and 1 March, 2000; it was open to a wide scientific audience. The workshop with published proceedings book was, as a matter of fact, the *innovative* form of exam that I proposed for the advanced research course. The contributions were refereed and their quality is high on average, exceptionally high in a few cases. The workshop is presented in more detail in Sect. 3.

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The advanced research course and the workshop all together produced great enthusiasm in the students and welcomed the participation of a hundred different people, which means *an order of magnitude* more than an average graduate course at Chalmers University of Technology and Göteborg University. What else should I say? Enjoy reading the proceedings book!

2 The Advanced Research Course

2.1 Lectures

1. Basics about fluids (2 hours).
2. The equations of motion (4 hours).
3. Simple applications (4 hours).
4. Instabilities (4 hours).
5. Turbulences and fractals (2 hours).
6. Astrophysical fractals: interstellar medium and galaxies (1 hour).
 - References: Combes (1999b).
7. Which thermal physics for gravitationally unstable media? (1 hour).
 - References: Pfenniger (1998).
8. Shocks (4 hours).
9. Magnetic fields (4 hours).
10. Gas dynamics vs. stellar dynamics and plasma physics (2 hours).

References: Shu (1992), unless otherwise specified; see also van Dyke (1982), Shore (1992), Dyson & Williams (1997) and Choudhuri (1998).

2.2 Exercises

1. Birth, life (and death?) of a galaxy: a step-by-step problem (6 hours).

References: Padmanabhan (1996); see also Binney & Tremaine (1987) and Binney & Merrifield (1998).

2.3 Parallel Seminars on Hot Topics

1. ‘Wavelets: A Presentation for Scientists’ – Alessandro Romeo (2 hours).
 - Multimedia: computer-projector show using the Matlab Wavelet Toolbox, running on a high-performance Linux machine; public computer lab.
 - References: Press et al. (1992), Vetterling et al. (1992), Misiti et al. (1997), Hubbard (1998), Mallat (1998), Bergh et al. (1999) and Wavelet Digest.

2. ‘Black-Hole Accretion Discs’ – Marek Abramowicz (2 hours).
3. ‘Wavelets at Work in Physics’ – Alessandro Romeo (2 hours).
 - Multimedia: computer-projector show using the Matlab Wavelet Toolbox, running on a high-performance Linux machine; public computer lab.
 - References: Bowman & Newell (1998), Fang & Thews (1998), Goedecker (1998) and van den Berg (1999).
4. ‘Small-Scale Structure and Dynamics in the Interstellar Medium’ – John Black (2 hours).
5. ‘Wavelets at Work in Astrophysics’ – Alessandro Romeo (2 hours).
 - Photographs: <http://www.mvd.chalmers.se/~pergus/alessandro/> .
 - Multimedia: computer-projector show using the Matlab Wavelet Toolbox, running on a high-performance Linux machine, and the documentation of the MR/1-MR/2 Software Packages; public computer lab.
 - References: Fang & Thews (1998), Starck et al. (1998) and van den Berg (1999).
6. ‘Magnetic Fields in Galaxies’ – Cathy Horellou (2 hours).
7. ‘Dynamical Modelling of Disc Galaxies: Multi-Scale Structures’ – Alessandro Romeo (2 hours).
 - References: Romeo (1994), Friedli (1996), Zhang (1996), Masset & Tagger (1997), Romeo (1997, 1998a, b), Zhang (1998), Block & Puerari (1999), Combes (1999a), Erwin & Sparke (1999), Friedli (1999), Martini & Pogge (1999), Shlosman (1999), Zhang (1999), Combes (2000), Englmaier & Shlosman (2000), Maciejewski & Sparke (2000) and Shlosman (2000).

3 The Workshop

1. ‘Turbulence and Fractal Analysis Using Wavelets’ – Michael Försth (1.5 hours).
 - Proceedings: review paper.
 - Referees: Jöran Bergh, Cathy Horellou and Alessandro Romeo.
2. ‘Dark Matter and Cold Fractal Clouds’ – Achim Tappe (1.5 hours).
 - Proceedings: review paper.
 - Referees: John Black, Alessandro Romeo and Tommy Wiklind.
3. ‘Fractals and Large-Scale Structure of the Universe’ – Ģirts Barinovs (1.5 hours).
 - Proceedings: paper.
 - Referees: Alessandro Romeo and Tommy Wiklind.
4. ‘Magnetohydrodynamic Turbulence in Accretion Discs’ – Rim Turkmani (1.5 hours).

- Proceedings: review paper.
 - Referees: Arto Heikkilä, Alessandro Romeo and Ulf Torkelsson.
5. ‘Galaxy Collisions’ – Nils Tarras-Wahlberg (1.5 hours).
 - Proceedings: abstract.
 - Referees: Alessandro Romeo.
 6. ‘The Outflow-Disc Interaction in Young Stellar Objects’ – Michele Pestalozzi (1.5 hours).
 - Proceedings: review paper.
 - Referees: John Conway, Michael Olberg and Alessandro Romeo.
 7. ‘Jets from Herbig-Haro Objects’ – Jiyune Yi (1.5 hours).
 - Proceedings: abstract.
 - Referees: Alessandro Romeo.
 8. ‘Origin and Propagation of Extragalactic Jets’ – Alessandro Laudati (1.5 hours).
 - Proceedings: abstract.
 - Referees: Alessandro Romeo.
 9. ‘Why Are Evolved-Stellar Atmospheres Clumped?’ – Liz Humphreys (cancelled).
 10. ‘Ionization Fronts and Photo-Dissociation’ – Henrik Olofsson (1.5 hours).
 - Proceedings: review paper.
 - Referees: John Black, Åke Hjalmarson and Alessandro Romeo.

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